

# JOURNAL OF THE BOMBAY NATURAL HISTORY SOCIETY

August 2000

Vol. 97

No. 2

## PHEASANT ABUNDANCE IN SELECTIVELY LOGGED AND UNLOGGED FORESTS OF WESTERN ARUNACHAL PRADESH, NORTHEAST INDIA<sup>1</sup>

APARAJITA DATTA<sup>2</sup>

(With one text-figure)

**Key words:** Abundance, Arunachal Pradesh, kaleej pheasant, *Lophura leucomelana lathami*, logging, northeast India, peacock-pheasant, *Polyplectron bicalcaratum*, red jungle fowl, *Gallus gallus*

Relative abundance of three pheasant species was compared along trails, across recently logged forest, 20-25 years old logged forest, unlogged primary forest, a relatively disturbed primary forest and a mixed-species plantation in Pakhui Wildlife Sanctuary, and Doimara and Papum Reserve Forests, Arunachal Pradesh, northeast India. The three pheasant species recorded were the red jungle fowl (*Gallus gallus*), black-breasted kaleej pheasant (*Lophura leucomelana lathami*) and the grey peacock-pheasant (*Polyplectron bicalcaratum*). Overall pheasant abundance was highest in unlogged forest and low in all other strata. No pheasants were sighted in the plantation. All three species were most abundant in unlogged forest. The probable causes of the relatively low abundance of pheasants in logged and disturbed forests are discussed especially in relation to subsidiary impacts of logging such as increased human disturbance and hunting due to easier access through logging roads.

### INTRODUCTION

During a six month study on the responses of arboreal mammals to selective logging in western Arunachal Pradesh, India, the relative abundance of three pheasant species was also recorded systematically along trails. The pheasant species were the red jungle fowl (*Gallus gallus*), black-breasted kaleej pheasant (*Lophura leucomelana lathami*) and grey peacock-pheasant (*Polyplectron bicalcaratum*). These species were compared across 5 categories of traits, i.e., plantation, semi-disturbed forests, old logged forests, recently logged and unlogged primary forests.

An earlier survey solely for pheasants in the same area reported the occurrence of the grey peacock-pheasant and the red jungle fowl (Kaul and Ahmed 1992). The kaleej was not sighted during that survey. The grey peacock-pheasant was encountered in densely forested areas with undulating terrain in the earlier survey. Its presence was mostly ascertained from calls. Kaul (1993) suggested that estimates of population densities of peacock-pheasant and red jungle fowl can be made from call counts in the Eastern Himalaya.

### STUDY SITES

The study sites were located in Pakhui Wildlife Sanctuary (WLS) and Doimara and Papum Reserve Forests (RF) in east and west Kameng district, western Arunachal Pradesh

<sup>1</sup>Accepted July, 1998

<sup>2</sup>Wildlife Institute of India  
Post Bag 18, Dehra Dun 248 001,  
Uttar Pradesh, India.

(Fig. 1). Pakhui WLS covers an area of 862 sq. km and is bounded on the north and west by the Bhareli river, on the east by the Pakke river, and the south by the Nameri WLS and reserve forests of Assam. Doimara RF lies to the west of Pakhui WLS in west Kameng district, while Papum RF lies to the east, in east Kameng district. Both the RFs fall in the Khellong Forest Division and together cover about 300 sq. km. The area lies in the foothills of the Himalaya and the terrain is undulating and hilly. The altitude ranges from 200 to more than 1,500 m above msl. The vegetation is tropical, semi-evergreen, with moist areas near streams having a profuse growth of bamboo, cane brakes and palms. The forest has a typical layered structure with the major emergent species being *Tetrameles nudiflora*, *Altingia excelsa* and *Ailanthus grandiflora*. There is a distinct middle storey; the understorey is largely made up of shrubs such as *Clerodendron*. The forests are rich in woody liana and climber species as well as epiphytic orchids and ferns.

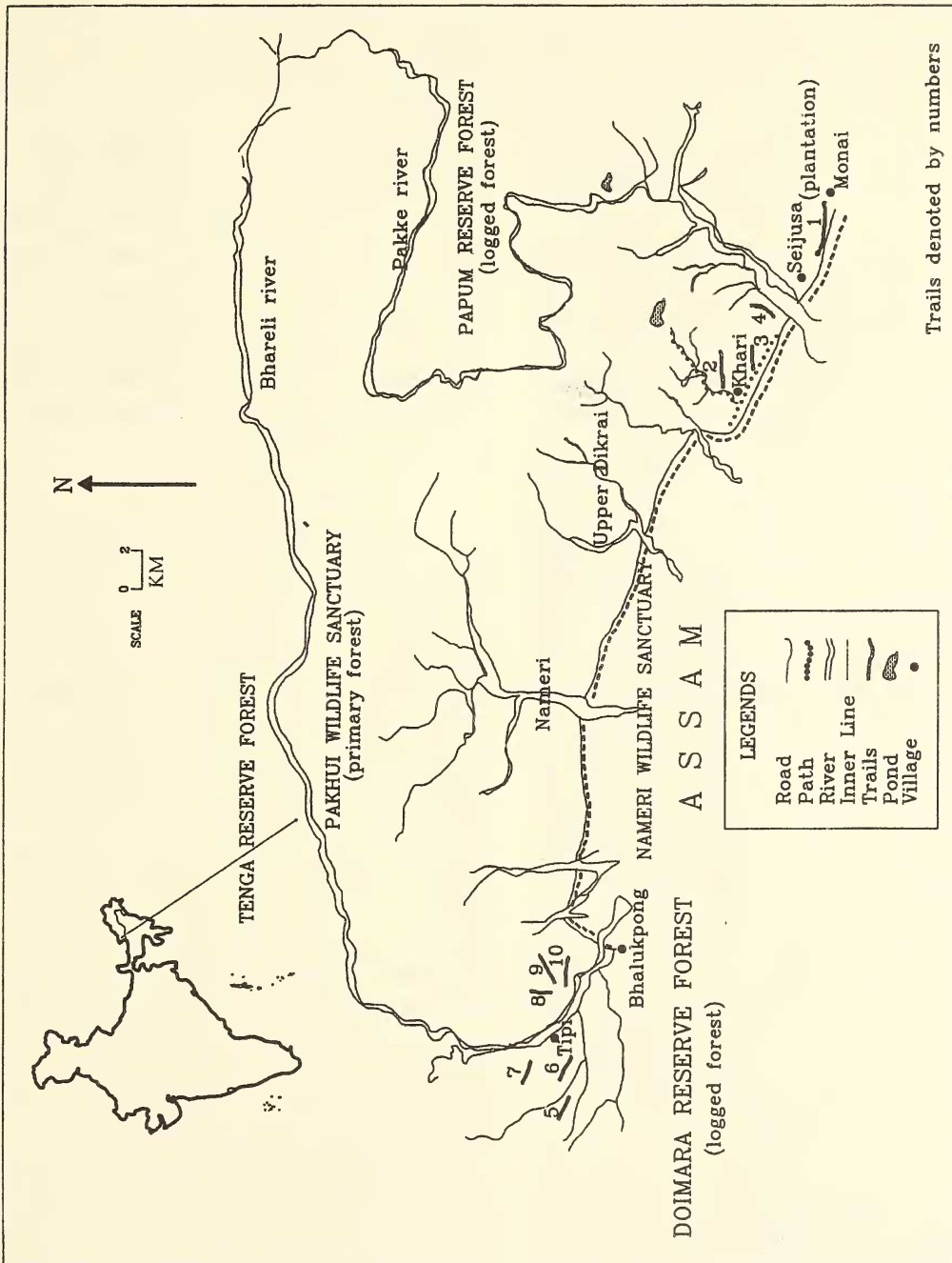
The area has a great diversity of mammalian fauna. The ungulates found here include gaur (*Bos gaurus*), sambar (*Cervus unicolor*), barking deer (*Muntiacus muntjac*) and wild pig (*Sus scrofa*). Elephants were sighted several times in the sanctuary, and once in the plantation. Carnivore fauna includes the tiger (*Panthera tigris*) leopard (*P. pardus*), clouded leopard (*Neofelis nebulosa*), smaller cats and several civet species. Three primate species namely, rhesus macaque (*Macaca mulatta*), Assamese macaque (*M. assamensis*) and the capped langur (*Semnopithecus pileata*) and four squirrel species, the Malayan giant squirrel (*Ratufa bicolor*), Pallas red-bellied squirrel (*Callosciurus erythraeus*), hairy-bellied squirrel (*Callosciurus pygerythrus*) and Himalayan striped squirrel (*Tamiops macclellandi*) are the most commonly encountered mammals. A total of 256 bird species have been recorded from the area (Singh 1991, 1994, Datta *et al.* 1998).

#### DESCRIPTION OF CENSUS TRAILS

**Plantation - Trail 1, Seijusa-Monai (Papum RF):** Trail walks totalled 34.5 km. A logging road was used for the census. The altitude ranged from 400 to 500 m above msl. The plantation was mixed; the major species were *Terminalia myriocarpa*, *Duabanga grandiflora*, *Phoebe goalparensis*, *Bombax ceiba*, *Gmelina arborea* and the exotic *Tectona grandis*. This plantation borders the reserve forests of Assam. There are settlements surrounding this area with patches of cultivation and degraded forest. The total area covered by the plantation is c. 3-4 sq. km.

**Semi-disturbed forests - Trails 2 & 3, Khari (Pakhui WLS):** A total of 30.94 km was walked in this habitat. The two trails identified for monitoring were replicated 7 times each. These were elephant trails/paths at 450 to 550 m above msl. The trails were adjacent to steep gullies and *nalas*; canes and palms were abundant, bamboo clumps occurred along the slopes. Cane extraction on a commercial basis occurred till 1991. Cane-cutters occasionally enter the forests from the adjacent reserve forests of Assam. The area is adjacent to Nameri WLS, Assam, and lies in the southern part of the sanctuary. It has not undergone selective felling in the past.

**Old logged forest - Trail 4, Seijusa-Khari (Pakhui WLS):** Census walks totalled 27 km. A trail of 2.7 km was replicated 10 times at altitudes ranging from 550 to 800 m above msl. A patrolling trail cut by the Forest Department staff in 1994 was used. An area of c. 4 sq. km had been selectively felled when the Pakhui Sanctuary was a reserve forest, prior to 1978. This area also lies in the extreme southeastern part of the sanctuary near the Arunachal Pradesh-Assam border. Several colonizing species such as *Bauhinia purpurea* and *Mallotus* sp. common in secondary forests, occurred here.



Trails denoted by numbers

Fig. 1: Map of the Study area



**Recently logged forest - Trails 5, 6 & 7, Tipi, west of Bhareli river (Doimara RF):** A total of 53.28 km was covered in this habitat. Three trails varying in length from 1.7 to 3 km were replicated 8 times each. The altitude ranged from 500 to 850 m above msl. The area is close to Tipi with a human population of about 900. Logging operations were active along two of the trails and had concluded in the third trail. A few small labour camps occurred in the logged forest sites. Elephants and small trucks were used to transport the logs to the two sawmills and one plywood mill nearby. Due to the presence of both reserve forests and a sanctuary on all sides, the forests in this region are contiguous. The Bhareli river and Tezpur-Bomdila highway act as the boundary between Pakhui WLS and Doimara RF.

**Unlogged primary forest - Trails 8, 9 & 10, Tipi, east of Bhareli river (Pakhui WLS):** Census walks totalled 41.4 km. The three trails were located near the southwest boundary of the sanctuary across the River Bhareli from Tipi. Two existing patrolling trails were used and one additional trail had to be cut for the census walks. A vast portion of the central and northern parts of the sanctuary is quite inaccessible due to the dense vegetation, hilly terrain and the lack of trails. The sole village, Mabusa, to the south of the sanctuary, has been relocated outside the boundary of the sanctuary. One or two settlements are present near the northern boundary. The Bhareli river acts as a barrier to human disturbance, though occasionally local tribals may cross over. Therefore, most of Pakhui WLS, except a small strip to the south, has excellent undisturbed primary forest.

#### METHODS

Five habitats were selected, based on their logging history. The trails in the different habitats were so selected as to be similar in general vegetation type (though abundances of various species and composition differed

somewhat), rainfall and altitude.

Ten trails, adding to a total of 187.12 km, were walked in five habitats, each being replicated 6-10 times during the study period from December 1995 to April 1996. All trails were walked in the morning, and the calls and sightings of pheasants were recorded. Relative pheasant abundance was compared using a simple measure of encounter rate; numbers seen/heard per km. Both calls and direct sightings were used in the calculation of encounter rates. Since sightings were few, statistical comparisons were not made. Encounter rates were simply calculated by dividing the total number of calls and sightings in each habitat by the total distance walked in each habitat.

#### RESULTS AND DISCUSSION

Three pheasant species were recorded, namely, the red jungle fowl (*Gallus gallus*), black-breasted kaleej pheasant (*Lophura leucomelana lathami*) and the grey peacock-pheasant (*Polyplectron bicalcaratum*). All three species were recorded in unlogged and logged forest. Only the peacock-pheasant was heard in semi-disturbed forest along the trails, though the red jungle fowl was heard/seen there otherwise. The red jungle fowl and peacock-pheasant were also recorded in the old logged forest. No pheasant species were recorded in the plantation. Partridges were also sighted twice in the unlogged forest but could not be identified. The white-cheeked partridge (*Arborophila atrogularis*) has been reported earlier (Singh 1994).

Overall abundance of pheasants was highest in unlogged forest (0.70/km),  $n = 29$  (calls and sightings). All other habitats had much lower abundance (Table 1).

Though the peacock-pheasant was never sighted, vocalization confirmed its presence in all the habitats except the plantation. It was the most abundant in unlogged forest (0.34/km,  $n = 14$  calls), followed by semi-disturbed forest (0.16/km,  $n = 5$  calls). They were heard only

TABLE I  
ENCOUNTER RATES OF PHEASANTS IN THE FIVE STRATA

	Unlogged Forest	Semi-disturbed Forest	Old logged Forest	Logged Forest	Plantation
Overall	0.70/km	0.16/km	0.11/km	0.11/km	-
Red jungle fowl	0.10/km	-	0.07/km	0.09/km	-
Kaleej pheasant	0.26/km	-	-	0.02/km	-
Peacock-pheasant	0.34/km	0.16/km	0.04/km	*	-

\* Heard call once, but not during trail walk

once each in the old logged forest and in logged forest. This species was very vocal, calling frequently from 0600 hrs onwards. Within India, the peacock-pheasant occurs only in the northeast, and is generally found in dense evergreen and semi-evergreen forest. Like the kaleej, it prefers to be near water, especially in the breeding season (Johnsgard 1986). The species reportedly thrives under conditions of secondary forest succession (Johnsgard 1986), but is highly vulnerable to snaring (Baker 1930). Feathers of a dead bird were found in Khari; trapping and snaring occurs occasionally. Remains of peacock-pheasants have been seen elsewhere in Arunachal Pradesh (Athreya and Karthikeyan, unpubl. data; Kaul and Ahmed 1992; *pers. obs.* 1996; Rashid Raza, *pers. comm.* 1995; Vidya Athreya, *pers. comm.* 1995). A freshly killed specimen of peacock-pheasant and several traps for pheasants were seen in West Khasi and Garo hills in Meghalaya (A. Christy Williams, *pers. comm.* 1995).

Kaleej pheasant was sighted only in unlogged forest and heard once each in old logged forest and in logged forest. Kaleej was sighted on ten occasions and a call was heard once in unlogged primary forest (0.26/km). The kaleej has an overall wide distribution and survives well in a variety of disturbed and undisturbed habitats and reportedly withstands hunting pressure fairly well (Bump and Bohl 1961). This is not borne out by the present observations, since kaleej were sighted only in unlogged forest. It is, however, not very vocal, and overall abundance may thus have been

underestimated. All literature pertaining to this species cites the importance of proximity to water (Baker 1930, Ali and Ripley 1983, Johnsgard 1986). Ample rock cover and proximity to water are reported to be major requirements for nesting (Johnsgard 1986).

Red jungle fowl was recorded in three habitats during the trail walks. This species was marginally more abundant in unlogged forest (0.10/km) than logged forest (0.09/km) and old logged forest (0.07/km). Red jungle fowl occurs in a wide range of habitats, and is reportedly more common in secondary forests associated with abandoned clearings, or edges of bamboo forest (Johnsgard 1986). During this survey, it was found to be marginally more abundant in unlogged forest than logged and old logged forest. This could be related to more intense hunting for pheasants in the logged areas or to their being shy of human presence.

The dissimilar calling patterns of these pheasant species could have biased the observed encounter rates. In addition, the main calling period for all these species is from March to May (Johnsgard 1986). Kaul & Ahmed (1992) sighted/heard more red jungle fowl than peacock-pheasant and attributed this to their more noisy habits, and propensity for feeding at the edges of roads. During this study, I used only the existing small trails in the forest which were different from the ones used in the earlier survey (Kaul and Ahmed 1992), hence red jungle fowl were probably encountered less during this study. The peacock-pheasant was the most commonly encountered pheasant because of its frequent



vocalization early in the morning. These birds remain in dense undergrowth and are great skulkers (Ali and Ripley 1983), therefore direct sightings are rare. The kaleej pheasant does not have a regular calling pattern and usually calls only when flushed. Therefore, its abundance may have been underestimated. Unlike the red jungle fowl, kaleej are said to be usually silent during the day (Ali and Ripley 1983).

It is surprising that there were so few encounters with pheasants in the logged forest, old logged forest and semidisturbed forest despite the fact that all three sites had a profusion of bamboo clumps in some areas, whereas bamboo was not recorded in the vegetation plots in unlogged forest. According to Ali and Ripley (1983), all the 3 pheasant species discussed here are partial to bamboo seeds. But mass flowering of bamboo is sporadic, and therefore the presence of bamboo may not be important to pheasant abundance. These birds are largely omnivores, feeding on grain, seeds, tubers, insects, small snakes and lizards. Insect abundance was not estimated for a comparison of food availability between these areas, but reduced insect abundance in logged forest has been reported (Johns 1986).

Canopy cover and degree of disturbance may be more important in affecting pheasant abundance. Canopy cover, tree density and basal area were reduced in logged forest and plantation (Datta and Goyal 1997). Johns (1989) found that terrestrial birds are more severely affected by logging because of the effects of microclimatic changes on the leaf litter fauna which were entirely absent from recently logged forest. Physiological considerations (heat and water balance) may be more important in determining the movement patterns of understorey birds than local food abundance (Karr and Freemark 1983). Habitat changes, such as destruction of understorey, affect all pheasants (Gaston 1982). The reduced canopy cover and tree density in logged forest and plantation definitely changes

the microclimate in the understorey due to increased insolation. Semi-disturbed forest and old logged forest, though similar in canopy cover and tree density to unlogged forest, were subject to human disturbance in the form of occasional cane-cutters from Assam. There are also stray reports and evidence of trapping of pheasants by local tribals in this area.

Katti *et al.* (1992) reported that hunting by the tribals is more severe in the foothill forests near villages. This, coupled with increase in non-tribal populations and road construction in and around reserve forests (logged areas) results in more disturbance. Pheasants and other large birds such as hornbills are worst affected by hunting (Katti *et al.* 1992). Johns (1986, 1989) states that partridges (Phasianidae) do not survive logging successfully, though the effects on pheasants are not mentioned. Wilson and Johns (1982) found that the great argus pheasant (*Argusianus argus*) was most abundant in unlogged primary forest, in reduced numbers in 3-5 years old logged forest, and totally absent from disturbed, recently logged forests and plantation. Therefore, reduced pheasant abundance in logged and disturbed forests and a total absence in the plantation seems to be caused by a combination of modified habitat, human presence and the consequent trapping and snaring of these terrestrial birds. There is also a possibility that the observed pattern is due to these birds being shy of human presence in logged and disturbed forests, the birds' greater alertness because of occasional trapping by the local labour and tribals. Therefore, even though logging may not directly affect them, the construction of roads in logged areas leads to increased accessibility to local people for hunting. The movement of people and presence of labour camps during and after logging operations results in disturbance. The unlogged primary forest, on the other hand, is little disturbed by hunting or human presence, consequently birds are not shy and can be sighted

or heard at closer quarters. The greater numbers of pheasants encountered in unlogged primary forest, despite the dense vegetation and lower visibility, is indicative of the importance of such habitats to pheasants, rather than modified habitats.

ACKNOWLEDGEMENTS

This work was carried out during field work for a project funded by the Wildlife

Institute of India and I thank the Director, WII for facilities provided. I thank the Arunachal Pradesh Forest Department. for permission to work in the field, especially Shri D.N. Singh (DFO, Pakhui WLS), Shri Oni Dai (DFO, Khellong Forest Division) and Shri Pratap Singh (DCF, Itanagar) for help and support during field work. Helpful comments on the manuscript were given by Rashid Raza and Charudutt Mishra.

REFERENCES

- ALI, S. & S.D. RIPLEY (1983): Handbook of the Birds of India and Pakistan. Compact edition, Oxford University Press, Bombay.
- \*BAKER, E.C.S. (1930): Game birds of India, Burma and Ceylon. Vol 3. John Bale and Son, London.
- \*BUMP, G. & W.H. BOHL (1961): Red jungle fowl and kaleej pheasants. U.S. Fish and Wildlife Service, Special Scientific Report, Wildlife No. 62.
- DATTA, A. & S.P. GOYAL (1997): Responses of arboreal mammals to selective logging in western Arunachal Pradesh. Draft report submitted to Wildlife Institute of India, Dehra Dun.
- DATTA, A., P. SINGH, R.M. ATHREYA & S. KARTHIKEYAN (1998): Birds of Pakhui Wildlife Sanctuary in western Arunachal Pradesh. *Newsletter for Birdwatchers* 38(6): 91-96.
- GASTON, A.J. (1982): Surveys, census, monitoring and research: their role in pheasant conservation. *In: Savage, C. (Ed.) Pheasants in Asia, 1982. Proceedings of the 2nd International Pheasant Symposium, Srinagar, Kashmir.* pp. 33-39.
- JOHNS, A.D. (1986): Effects of selective logging on the ecological organisation of a peninsular Malaysian rainforest avifauna. *Forktail* 1: 65-79.
- JOHNS, A.D. (1989): Recovery of a Peninsular Malaysian rainforest avifauna following selective timber logging: the first twelve years. *Forktail* 4: 89-106.
- JOHNSGARD, P.A. (1986): The pheasants of the world. Oxford University Press.
- KARR, J.R. & K.E. FREEMARK (1983): Habitat selection and environmental gradients: dynamics in the 'stable' tropics. *Ecology* 64: 1481-1494.
- KATTI, M., P. SINGH, N. MANJREKAR, S. MUKHERJEE & D. SHARMA (1992): An ornithological survey in eastern Arunachal Pradesh, India. *Forktail* 7: 75-89.
- KAUL, R. (1993): Pheasant surveys in Arunachal Pradesh, India. The WPA Journal XVII & XVIII, 1992-1993.
- KAUL, R. & A. AHMED (1992): Pheasant studies in northeast India, Arunachal Pradesh. Unpublished report.
- SINGH, P. (1991): Avian and mammalian evidences in Pakhui Wildlife Sanctuary in East Kameng district, Arunachal Pradesh. *Arunachal Forest News* 9(2): 1-10.
- SINGH, P. (1994): Recent bird records from Arunachal Pradesh. *Forktail* 10: 65-104.
- WILSON, W. & A.D. JOHNS (1982): Diversity and abundance of selected animal species in undisturbed forest, selectively logged forest and plantations in East Kalimantan, Indonesia. *Biol. Conserv.* 24: 205-218.
- \* Not seen in original

